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# New Taxa and Nomenclatural Notes on the Flora of the Marojejy Massif, Madagascar. VI. Rubiaceae: A New Species of *Lemyrea*

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**ABSTRACT.** *Lemyrea marojejyensis* J. R. Stone & A. P. Davis, a new species from the Marojejy National Park in Madagascar, is described and illustrated. The thick branchlets, large leaves, shortly pedicellate flowers, and large number of ovules (ca. 32 per locule) distinguish it from other species of *Lemyrea*. Systematic observations on the genus *Lemyrea* are provided.

**Key words:** *Lemyrea*, Madagascar, Marojejy, Octotropideae, Rubiaceae.

Madagascar is a country rich in endemic species and remains poorly known botanically (Morat & Lowry, 1997). In particular, the isolated massifs of northern Madagascar are extremely diverse and have yielded many new species. The broken chain of upland areas that traverses northern Madagascar contains some of the largest areas of remaining primary forest and undisturbed natural areas. While several of the larger mountains are included within protected areas, much of the area in between is unprotected and its vegetation remains threatened. This northern massif region remains poorly known botanically, but the available collections indicate that the region is home to a considerable number of endemic species. The massif at Marojejy has been one of the better collected of these isolated uplands (Humbert, 1955), yet new discoveries are still being published on a regular basis (e.g., Miller, 1998; Miller & Randrianasolo, 1998; Miller, 2000). The central portion of the Marojejy Massif and some of the surrounding lowlands comprise the 60,050-hectare protected area. Formerly known as the Réserve Intégrale No. 12, established 31 December 1927, the status of this protected area was upgraded to a National Park (Marojejy Réserve Naturelle Intégrale) on 19 May 1998.

The middle elevations (ca. 600–1200 m) of the Marojejy Massif seem particularly rich and diverse

in woody plant families. Araliaceae, Arecaceae, Clusiaceae, Cunoniaceae, Myrsinaceae, and Rubiaceae are particularly well represented; the herbaceous family Balsaminaceae is represented by more than 30 species (Morat & Lowry, 1997). These slopes have been the site of many newly described taxa: e.g., *Ardisia marojejyensis* J. S. Miller & Pipoly (Myrsinaceae) (Miller & Pipoly, 1993); *Sabicea marojejyensis* Razafimandimbison & J. S. Miller (Rubiaceae) (Razafimandimbison & Miller, 1999); *Rhodolaena macrocarpa* G. E. Schatz, Lowry & A. E. Wolf (Sarcolaenaceae) (Schatz et al., 2000); *Weinmannia marojejyensis* J. S. Miller & J. Bradford (Cunoniaceae) (Bradford & Miller, 2001). Recent collections from these middle-elevation parts of the reserve now yield another new species of Rubiaceae belonging to the genus *Lemyrea* (A. Chevalier) A. Chevalier & Beille.

***Lemyrea marojejyensis*** J. R. Stone & A. P. Davis, sp. nov. TYPE: Madagascar. Prov. Antsiranana: Marojejy Réserve Naturelle Intégrale, path from Mandena to summit of Marojejy, 700–1000 m, 14°26'S, 49°45'E, 2 Oct. 1994 (fl), *Lewis et al. 1249* (holotype, MO; isotypes, BR, G, WAG, K, P, TAN). Figure 1.

Arbor usque 9 m alta, ramis crassis et nodos tumidis. Folia coriacea, lamina late elliptica usque late obovata, 7.5–10 cm longa, 4–5.5 cm lata. Inflorescentiae axillares, binae, 1.9–2.2 cm longae. Pedicelli 1.5–2.4 mm longi. Corolla late infundibuliformis, carnosae, 1.3–1.5 cm longa, 5–8 mm lata. Ovarium 2-loculare, ovulis in quoque loculo circa 32.

Tree, 5–9 m tall. Branchlets terete to subquad-rangular, swollen at nodes, 3.5–7 mm diam., smooth to somewhat scaly, brown to light gray or whitish. Leaves: petioles distinctly articulated at the junction with the branchlet, 0.3–1 cm long, glabrous, base adaxially canaliculate; lamina broadly elliptic to broadly obovate, 7.5–10 × (3.4–)4–5.5(–



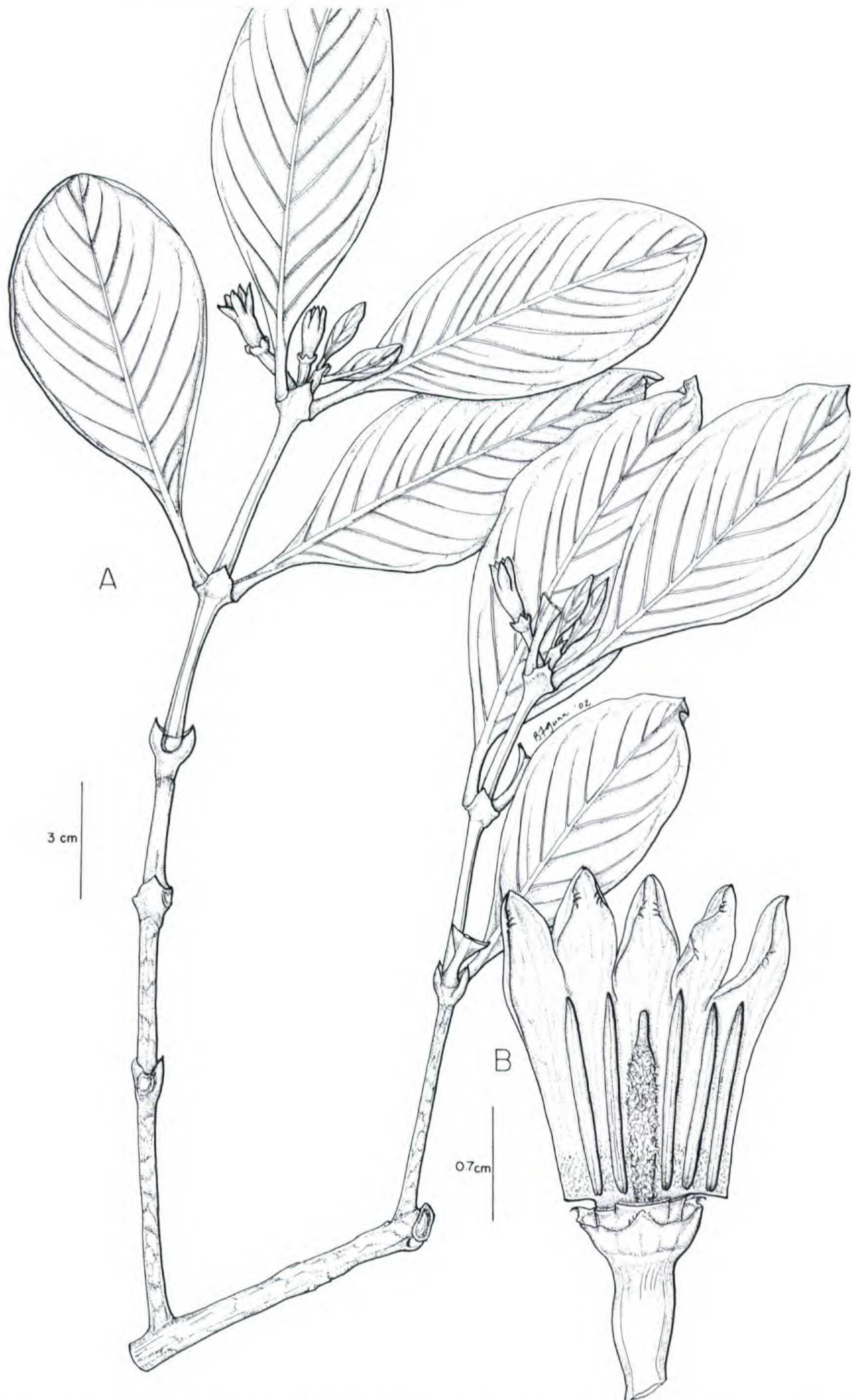


Figure 1. *Lemyrea marojejensis* J. R. Stone & A. P. Davis. —A. Habit. —B. Flower, cut to reveal internal corolla surface, anthers, and style. Drawn from the holotype: *Lewis et al.* 1249.

6.6) cm, coriaceous; base attenuate; margin entire, subrevolute; apex acute to acuminate; midrib prominent; venation brochidodromous; secondary veins prominent on lower and upper surfaces, 11 to 15 pairs, ascending at an angle of 45°–60°, straight to

slightly curved; tertiary venation obscure; adaxial and abaxial surfaces smooth, glabrous. Stipules fused, broadly triangular, 2.2–2.5 × 3.5–5.5 mm, glabrous; apex abruptly apiculate, apiculum 0.7–1.1 mm long. Inflorescences axillary in the first



node below the apex of the branchlet, paired (one inflorescence per axil), 1-flowered, 1.9–2.2 cm long. Flowers hermaphrodite, 5-merous, pedicel 1.5–2.4 mm long; calyx (incl. hypanthium) tubular, 6–7.8 mm long, texture slightly rough; calyx limb 5-lobed, sparsely ciliolate, lobes  $\pm$  deltate, 0.5–0.7  $\times$  1.2–1.6 mm, green with reddish tips; corolla broadly funnel-shaped, 1.3–1.5 cm long  $\times$  5–8 mm wide, rather fleshy, white to creamy white, the inner surface sometimes red-tinged, glabrous; corolla tube 6.5–7  $\times$  4–5 mm; corolla lobes overlapping to the left in bud (aestivation) and usually at maturity, 5–7  $\times$  1.5–4 mm, apices acute; stamens 5, included; anthers attached near the base of the corolla tube, sessile, elliptic to linear, 8–10 mm long; style 8–10 mm long, pubescent (trichomes white, ca. 0.2 mm long); stigma 2-lobed, lobes ca. 3 mm long. Ovary bicarpellate, with axile placentation, ovary wall glabrous; ovules ca. 32 per locule, arranged in two discrete series, white. Fruit not seen.

*Distribution, habitat, and phenology.* *Lemyrea marojejensis* is known from two localities in the south-central part of Marojejy National Park in ridge-top forests between 700 and 1220 m. It has been collected in flower in October.

*Conservation status.* Provisional IUCN Red List Category: **Endangered** (EN B2 a b). The new species has an area of occupancy of less than 500 km<sup>2</sup> (10 km<sup>2</sup>), is only known from two populations, and its continuing decline is inferred. We have given this species a provisional assessment because further field surveys in and around Marojejy National Park may determine whether additional populations exist.

*Systematic notes.* *Lemyrea* was established by Chevalier (1939), based on *Coffea* series *Lemyrea* A. Chevalier (Chevalier, 1938). At the present time the genus comprises three species, viz. *L. utilis* (A. Chevalier) A. Chevalier & Beille (type species), *L. ciliolata* (A. Chevalier) A. Chevalier & Beille, and *L. krugii* (A. Chevalier) A. Chevalier & Beille. Robbrecht (1980, 1988, 1994) tentatively placed *Lemyrea* in the tribe Octotropideae Beddome, although in earlier works the tribal name Hypobathreae (Miquel) Robbrecht was used (see Robbrecht et al., 1994). We confirm that *Lemyrea* is a member of the tribe Octotropideae, on the basis of its articulated petioles, entire stipules, supra-axillary inflorescences, hermaphrodite flowers, left-contorted corolla lobes, 2-locular ovary with axile placentation, pendulous ovules, and a (seed) testa with a fingerprint-like pattern.

The Octotropideae consist of ca. 30 genera, 8 of which occur in Madagascar, namely *Canephora*

Jussieu, *Chapelieria* A. Richard ex DC., *Flagenium* Baillon, *Gallienia* Dubard & Dop, *Jovetia* Guédès, *Lemyrea* (A. Chevalier) A. Chevalier & Beille, *Polysphaeria* Hooker f., and *Galiniera* Delile, although the occurrence of *Galiniera* (one species: *G. myrtooides* Homolle) in Madagascar requires verification. *Canephora*, *Chapelieria*, *Flagenium*, *Gallienia*, *Jovetia*, and *Lemyrea* are endemic to Madagascar, although according to Capuron (1973 unpublished manuscript) these genera (excluding *Jovetia*) are congeneric with the Mascarene endemic *Fernelia* Commerson ex Lamarck. Schatz (2001) followed the same line of thinking and placed the above six genera as tentative synonyms of *Fernelia*. However, an ongoing study of this tribe (by A. Davis) shows that the association of these six genera with *Fernelia* is erroneous. *Fernelia* is functionally unisexual, has 4-merous flowers, and ovules attached to a septum at the apex of the ovary (i.e., in transverse section the ovary is bilocular at the apex and unilocular at the base). The Malagasy *Gallienia* shares the above characters with *Fernelia*, inferring perhaps a close relationship between these two genera, but it does not have functionally unisexual flowers. Of the other Malagasy genera it can be said that they possess sufficient clear-cut morphological differences to warrant recognition; any taxonomic decisions on their status, if required, must wait until a full survey of the tribe has been undertaken.

According to Chevalier (1939: 250) *Lemyrea* is characterized by umbellate inflorescences, nonconnate calyculi and bracts (“les bractéoles non soudées en calicules”), 5-lobed calyces with aristate lobes (“le calice à 5 dents aristées”), and campanulate corollas each with 4 or 5 lobes. His description of *Coffea* series *Lemyrea* (Chevalier, 1938) states that *Lemyrea* has two locules with one ovule in each locule, but he no doubt believed that the number of ovules per locule was the same as the number of seeds per locule. An anatomical study of *L. utilis* and *L. ciliolata* by Beille (1939) shows that the ovary is 2-locular with axile placentation, with more than four ovules per locule arranged in two series. Beille’s dissections also show that there are single-celled hairs on the ovary wall of both species; *L. utilis* has more hairs on the ovary wall than *L. ciliolata*.

Examination of *Lemyrea utilis*, *L. ciliolata*, and *L. krugii* (A. P. Davis, unpublished data) shows that the genus can be characterized by: distinctly articulated petioles; sessile inflorescences (i.e., lacking a peduncle); hermaphrodite, pedicellate (4–)5-merous flowers; a calyx with cusp-like to narrowly triangular lobes; sessile, submedifixed, linear anthers; a partially (lobed) or fully divided style (lobed due



to the style being adnate for most of its length); 2-locular ovaries with axile placentation, each locule with numerous ovules per locule arranged in two series (3 to 6 per locule in *L. utilis*; ca. 8 in *L. ciliolata*; and ca. 6 in *L. krugii*); entire endosperm (i.e., non-ruminate); and testa with a delicate fingerprint-like pattern. The seeds of *Lemyrea* are imperfectly known, and so far we have only seen one fruiting specimen each of *L. utilis* (Perrier 14175, K) and *L. ciliolata* (Capuron 27685-SF, TEF). We cannot verify the observation made by Chevalier (1938, 1939) and Beille (1939) that each seed of *L. utilis* has an invagination, like the adaxial (ventral) invagination of a *Coffea* seed. Investigation of *L. utilis* (Perrier 14175) shows that there might be an invagination on one surface, but this could be attributed to other factors (such as a collapsed immature seed). Developing ovules of *L. utilis*, and other *Lemyrea* species, do not have an invagination; the seeds of *L. ciliolata* (Capuron 27685-SF, TEF) lack any sort of invagination, i.e., they are entire (A. Davis, pers. obs.). We know that the testa of all *Lemyrea* species have a delicate fingerprint-like pattern because this is visible on developing ovules; the thick, fingerprint-like testa pattern present in genera such as *Chapeliera* and *Polysphaeria* Hooker f. is visible at the ovule stage and during seed development.

Our new species of *Lemyrea*, *L. marojejensis*, broadens the present circumscription of *Lemyrea* by having ca. 32 ovules per locule but otherwise easily falls within the circumscription of the genus. It is further distinguished from the other species of *Lemyrea* by having thick branchlets (3.5–7 mm diam.), large stipules (2.2–2.5 × 3.5–5.5 mm), large leaves (7.5–10 × (3.4–)4–5.5(–6.6) cm), and shortly pedicellate flowers (pedicel 1.5–2.4 mm long).

**Paratypes.** MADAGASCAR. **Prov. Antsiranana:** Marojejy Réserve Naturelle Intégrale, le long d'un affluent de la rivière Manantenina, 1220 m, 14°26'S, 49°44'E, 27 Oct. 1996 (fl), Rakotomalaza, Messmer & Ravelonarivo 784 (K, MO).

#### KEY TO THE SPECIES OF *LEMYREA*

- 1a. Inflorescences axillary in upper and lower leaf axils of the shoot; flowers 4-merous . . . . . *L. utilis*
- 1b. Inflorescences axillary in upper leaf axils of the shoot only; flowers 5-merous.
  - 2a. Leaves usually > 4 cm wide; floral pedicel ≤ 2.4 mm long; ovules > 30 per locule . . . . . *L. marojejensis*
  - 2b. Leaves usually < 3.5 cm wide; floral pedicel > 5 mm long; ovules < 10 per locule.
    - 3a. Corolla throat hairs present on almost the entire surface of the corolla tube;

style glabrous, divided to the base but adnate for most of its length . . . . . *L. ciliolata*

- 3b. Corolla throat hairs present only at the base of the corolla tube; style pubescent, divided into two lobes but not to the base . . . . . *L. krugii*

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